

CCD Photometry of Comet and Asteroid Targets of Spacecraft Missions

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We are conducting a program of CCD observations of comet and asteroids that are targets of spacecraft missions. The determination of physical parameters of mission targets is valuable in the design of the spacecraft, science payload, trajectories, and mission scenarios. We observed asteroid 4979 Otawara, flyby target of the Rosetta mission, in December, 1998 and January, 1999 and determined a rotation period of 2.70 ± 0.05 hours. Based on the light curve, the minimum axial ratio for this object, $a/b = 1.3$. Combined with the mean absolute R magnitude of 14.09, this suggests semi-axes of 2.1×1.6 km or 1.6×1.2 km for typical S-type or V-type albedos, respectively. We observed asteroid 10302 (1989 ML), target of the Muses C mission, in April and May, 1999 and found a rotation period near 19 hours. From the mean absolute R magnitude of 19.14, we find a mean radius of 0.38 km, assuming a C-type albedo. The asteroid displays an asymmetric and unusually high amplitude light curve, suggesting a minimum axial ratio of ~ 3 . We observed Comet 9P/Tempel 1, target of the late lamented Space Technology 4/Champollion mission, in December, 1998 and February, 1999 and obtained a mean absolute R magnitude of 14.85 ± 0.04 and a minimum axial ratio, $a/b = 1.3$. This corresponds to semi-axes of 3.8×2.9 km assuming a cometary albedo of 0.04. The rotation period of this comet nucleus is problematic, with evidence for a period as short as 14 hours or as long as 39 hours. We observed Comet 19P/Borrelly, flyby target of the extended Deep Space 1 mission, in July, 1998 and obtained a mean absolute R magnitude of 15.31 ± 0.1 , corresponding to a mean radius of 2.5 km, assuming a cometary albedo of 0.04. We thank Steward Observatory, the University of Hawaii, and Kitt Peak National Observatory for allocations of telescope time. This work was supported by the NASA Planetary Astronomy Program.

Abstract submitted for AAS \square meeting DPS99

Date submitted: 19990723 Electronic form version 3.0 (10 June 1999)